

# THE HAWAIIAN ISLAND: A CASE STUDY OF THE EFFECT OF POLIICIES TO STIMULATE INVESTMENT IN GREEN ENERGY RESOURCES

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## **Abstract**

Well-intentioned government policies intended to stimulate natural resource development can have many beneficial societal effects, but without diligent monitoring and mechanisms for adjustment, can also result in disproportionate burden to certain populations, particularly those least able to respond appropriately. Two examples of adverse effects that were not originally envisioned in the enactment of laws in Hawaii illustrate these pitfalls. Policymakers would be wise to learn from examples of other jurisdictions, including Hawaii, as they design their own frameworks to improve the quality of life for constituents.

## **Introduction**

The Hawaiian Archipelago is one of the most isolated landmasses in the world. Its isolation has led to numerous environmental challenges since large quantities of fuel and food have to be imported to sustain the livelihood of Hawaii citizens. For decades policymakers have enacted policies to reduce the dependence on imported fuels to address security, import substitution, and environmental concerns. In particular reducing imported oil use has been the focus of much attention as external forces have resulted in severe economic distress whether caused by natural disaster or market-based disruption. Paradoxically, the Hawaiian Islands are blessed with a wide variety of natural energy, the development of which has been desired since the initial Middle East oil crises of the 1970s.

Within the past decade, Hawaii has made remarkable progress driven by innovative policies to stimulate investment in clean energy resources. However, several unanticipated consequences have resulted from this rapid transformation to renewable energy. Certain laws have created inequitable sharing of benefits, adversely affecting disadvantaged social groups. Other governments and policymakers interested in promoting clean energy development can learn from the experiences of Hawaii, both good and bad.

## **Hawaii: A Model for Clean Energy Development?**

Hawaii's well-intentioned state policies have orchestrated a remarkable transformation within the last decade from oil dependence to increased diversity of commercial renewable energies from a variety of natural resources, most particularly geothermal, wind, and solar energy at scales both large and small. Notably in 2006, with the cooperation of both executive and legislative branches of state government, a highly progressive, integrative package of laws known as "Energy for Tomorrow" was adopted, addressing efficient use of energy, aggressive pursuit of renewable energy, fuels from agriculture, and transportation system efficiency. So significant was this achievement at the time that it caught the attention of many other states and locations, particularly the US Department of Energy. From these actions the Hawaii Clean Energy Initiative, a unique partnership among the State of Hawai'i, US Department of Energy, and major industrial stakeholders such as Hawaiian Electric Company was consummated in 2008 (USDOE, 2008). Parties to the Hawaii Clean Energy Initiative pledged to move the state from ninety percent dependency on imported oil to seventy percent clean energy by 2030 (40 percent from renewable energy and 30 percent from efficiency resources).

The solid policy framework and legislated requirements to achieve these unprecedented goals for natural energy substitution have been the basis for the remarkable transformation now taking place in Hawaii's energy system, with the electricity sector leading the way. In the years since 2008 Hawaii has consistently led the US in several metrics, consistently ranking in the top five nationally in installed solar electric system capacity per capita, dollar volume of energy efficiency investments in public buildings per capita, and percent of electricity derived from renewable energy delivered by Hawaii electric utilities (Hawaii SEO, 2014). Green jobs accounted for as much as twenty percent of construction employment in 2013 (Hawaii State Energy Office, 2014).

Between 2007 and 2013 the contribution of clean energy resources (both renewable energy and energy efficiency resources) increased from 15.8% to 33.7% statewide. In 2013 18% of the statewide electricity sold came from renewable energy (Hawai'i State Energy Office, 2014). On the smaller neighbor islands the achievements

are even more impressive. For example on Hawaii Island alone, close to 50% of the delivered electricity comes from renewable energy resources, mainly geothermal, utility-scale wind energy, and distributed solar photovoltaic systems.

In plans filed in 2014 by the Hawaiian Electric Companies in response to orders from the Hawaii Public Utilities Commission, the projected target for renewable energy contributions is 65% of energy delivered, compared to the original 40% target established by the Hawaii Clean Energy Initiative (HECO, 2014). The Companies also project that installed solar photovoltaic systems will increase by a factor of three by 2030.

However as described below, the benefits from this transformation have not been equitably distributed over the broadest customer segments. Moreover, the costs to obtain an essential commodity, electricity, have been disproportionately borne by certain electricity consumers.

### **Unanticipated Effects of Policies and Laws Designed to Encourage Solar Energy**

Between the same time period, 2007 to 2013, electricity rates have not been reduced markedly. High electricity costs increased demand for customer-owned solar electric systems during this period where presently, system installation on electricity distribution circuits is at levels exceeding the ability of the electric utility to comfortably approve more photovoltaic connections for fear of damaging consequences affecting electricity delivery and safety. One other notable societal consequence of the proliferation of these solar photovoltaic systems is their distribution, favoring consumers with greater ability to afford up front capital costs of installations. In short those customers with limited incomes, renters, and those living in multi-family housing have not been able to benefit as greatly from these systems. Instead, as revenues from customer-installed generation facilities decline for the utility, the electric utility's ability to recover fixed costs of capital investment and operating expenses gets disproportionately borne by the consuming public that has no choice but to rely on electricity provided solely by the legacy utility.

Therefore while the achievements to transform Hawaii from imported oil are certainly noteworthy on the surface, several challenges have arisen in the form of unintended consequences of Hawaii laws designed innocently to stimulate robust green

economic activity. Statutes enacted with good intentions can create market distortions that cause a disproportionate burden on certain populations least able to adapt, and these laws are equally difficult to change or repeal as they are to enact.

A combination of forward thinking, well intentioned laws have resulted in spectacular growth for the solar industry: state and federal tax incentives, renewable energy portfolio standards imposed on the electric utilities, feed-in-tariffs, net energy metering, and liberal changes to land use and zoning laws. These policies today have resulted in Hawaii being consistently ranked among the top leaders in installed solar electric capacity in the United States.

As more and more of these systems are installed, significant technical and economic challenges have appeared. In general early adopters of these more expensive green energy systems have greater ability to commit the capital investment required despite tax incentives available to all. With increasing amounts of solar the incumbent electricity providers have witnessed a marked drop in electricity consumption during daytime hours, accompanied with significant erosion of revenues collected from electricity consumers. At the same time the fixed costs of providing and delivering electricity generally remains constant, and these costs must be spread over the declining rate base, creating upward pressure on rates (UHERO, 2014). Electricity consumers without solar systems thus are placed in the unenviable position of having to pay a disproportionate share of the burden of paying for electricity services.

Because non-solar consumers tend to be from either financially disadvantaged populations (e.g. the lower income or rental housing segments) what started as government's well-intentioned policy to promote green energy has created inequitable treatment of benefits and must be recalibrated to create shared value across as much of society as possible.

The state has responded in some measure by attempting to formulate programs to facilitate greater participation from those currently without the ability to reduce electricity costs by installing solar electricity systems, mainly due to financial reasons. Hawaii's Governor signed a program called Green Energy Market Securitization (GEMS) into law as Act 211 in 2013 (Hawaii SEO, 2015). It is designed to provide low-cost capital to finance solar photovoltaics and other clean energy improvements for those who

would otherwise have difficulty obtaining such financing. GEMS utilizes novel financing mechanisms, including a rate reduction bond structure and on-bill financing. The first mechanism is based on a \$150 million bond issuance approved by the Hawaii Public Utilities Commission that will be repaid by a fee collected by all utility ratepayers. Consumers who utilize the GEMS program will repay for the program through their loan payments. The second mechanism, on-bill financing, is a separate program authorized by law and created by the Commission that will allow consumers to repay clean energy investments through savings on their utility bills.

Whether or not these programs succeed in extending the availability of renewable energy systems to currently underserved markets remains to be seen. Further GEMS is being financed by all electric utility customers through a new surcharge on electricity bills that some have called an increase to Hawaii's already high utility rates.

What started as a well-intentioned effort to stimulate market adoption of renewable energy, in this case solar energy, has demonstrated that unanticipated negative societal effects can occur. Policymakers would be wise to inform themselves using the experiences of related jurisdictions, including Hawaii, and attempt to structure policies that provide for some ability to adjust for these unintended consequences.

### **Contract Payments for Renewable Energy Result in Excessive Costs to Consumers**

Similarly other policies can have long-lasting effects that are difficult to correct and result in uneconomic behaviors. Following the lead of the federal government's Public Utilities Regulatory Purposes Act, PURPA, Hawaii enacted laws designed to counter the effects of overdependence on imported oil by requiring the purchase of electricity from independent producers of energy from both renewable sources and efficient use of conventional fuels through generation facilities that co-produce useful heat with the power generated. These policies generally required public utilities to purchase electricity from these independent power producers at the avoided cost of generation of the utility, in Hawaii, predominantly based on price of oil. Projects approved received compensation for energy produced at the cost of oil (so long as the variable cost of producing electricity is predominantly based on oil, as in Hawaii) for the life of the contract, often twenty years or more, and may have been attractive when the price of oil was low. Today we are

left with legacy projects whose revenues are still based on oil, now at far higher prices than at the time those contracts were approved, resulting in excessive current costs to consumers. Alternative technologies are now available that may be less costly through technology advancement. So while increasing the amount of renewable-based electricity as originally intended, consumers remain tied to far less attractive pricing today and for the life of these contracts.

Recent research and modeling conducted by the University of Hawai'i Economic Research Organization (UHERO) attempted to better understand the consumer cost implications of avoided cost contracts (Coffman, Bernstein, Wee and Frost, 2014). Because these contracts are tied to the price of oil in Hawaii, a generally more expensive fuel, costs can be expected to be greater than the levelized costs of production from these resources (mainly geothermal and wind) experienced elsewhere.

UHERO investigated the effects of these contracts on Hawaii Island in particular, where the cost of electricity has historically been high. Using their dynamic, partial equilibrium model to assess certain scenarios allowing for the extremes of maximum economic dispatch of these contracted assets (i.e. the utility has the ability to curtail energy purchases in favor of using lower cost resources) to accepting all of the energy produced at contracted rates, UHERO concluded that these contracts increased prices to consumers by approximately six percent. Savings could be even greater if there were the ability to renegotiate these contracts (Coffman et al, 2014).

While admittedly these estimates were limited by the ability to obtain information regarding the specificity of contract terms and exact payments, the researchers conclude that contracting terms indeed matter. When these contracts are negotiated and approved based on well-intentioned laws designed to promote natural resource development, laws and policies also do matter.

The Public Utilities Commission itself has considered the effects of these avoided cost contracts in its attempt to address electricity delivery challenges currently taking place. In one detailed examination, the Commission established a Reliability Standards Working Group to formulate stakeholder-driven solutions to alleviate concerns over incorporating large amounts of variable renewable energy (mainly solar and wind) into the existing electricity system. This changing resource mix has required the consideration

of new ways to address power quality and manage the dispatch of assets to maintain grid stability. In certain instances the existing solar and wind generation projects can provide grid services with nominal investment. However the Commission and its cohort of advisers found great difficulty in finding a way to provide these valuable ancillary services without first renegotiating the independent power producer contracts. Those power producers have little incentive to change their contracting model, citing the risks assumed in developing and financing these projects at inception (Hawaii PUC, 2013).

## **Conclusion**

Well-intentioned government policies intended to stimulate natural resource development can have many beneficial societal effects, but without diligent monitoring and mechanisms for adjustment, can also result in disproportionate burden to certain populations, particularly those least able to respond appropriately. Two examples of adverse effects that were not originally envisioned in the enactment of laws in Hawaii illustrate these pitfalls. Policymakers would be wise to learn from examples of other jurisdictions, including Hawaii, as they design their own frameworks to improve the quality of life for constituents.

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